O'Leary-Burke Civil Associates, PLC

CIVIL ENGINEERING | REGULATORY AND PERMIT PREPARATION | LAND SURVEYING | CONSTRUCTION SERVICES | LAND USE PLANNING

October 27, 2016

Greg Duggan, Town Planner
Town of Essex, VT
81 Main St. Essex Jct., VT

RE: 31 Allen Martin Drive, Essex
Forestdale Industrial Park, Thompson Drive, Essex, VT
Preliminary Subdivision Application

Dear Greg:

We are writing on behalf of Allen Brook Development Inc. c/o Al Senecal to request scheduling for review of the attached preliminary plan application. The application is for an 8 lot subdivision of 51.67+/- acres of a portion of parcel B located at the end of Thompson Drive in the Forestdale Industrial Park. This portion of Parcel B has been subdivided off of the original 401.41 acre piece as part of the applicant's master plan agreement with the Town of Essex. The project will include the construction of two new public roads including a 1,220 FT long extension of Thompson Drive and an 820 FT long cul-de-sac road proposed as Davision Drive. All of the new lots will be served by municipal water and sewer connections. The stormwater runoff created by the new roads will be captured and infiltrated in a roadside drywell network. Portions of the proposed lots are subject to the 200' residential buffer, 50' front yard buffer, and 25' side yard setbacks in the resource preservation district – industrial (RPD-I).

As part of the project a temporary gravel parking lot is being proposed at the end of the Thompson Drive extension to serve the Town of Essex. The parking lot will consist of 16 parking spaces and will be on a portion of Lot #8. In the future, when Thompson Drive is further extended, the permanent parking lot will be constructed on the northern side of Thompson Drive on Parcel C owned by the Town of Essex. All stormwater runoff from the parking lot will be collected in a perimeter swale and infiltrated onsite.

As part of the sketch plan application approved on 10/22/15 the Department of Public Works submitted a memorandum dated 10/2/15 in reference to the project. Please see below for responses to all of Public Works' comments and the sketch plan approval conditions:

13 CORPORATE DRIVE ESSEX JUNCTION VERMONT 05452
TEL 802 878 9990 | FAX 802 878 9989 | obca@olearyburke.com

Public Works Comments

Traffic

1. *A traffic study shall be provided to Public Works at Preliminary Plan submittal for review. This study will be used to access impacts to existing intersection and local roads, and to access highway impact fees.*

The attached traffic impact study was completed by Trudell Consulting Engineers. The traffic study was completed for the traffic generated as part of the sand extraction facility and the 8 lot commercial subdivision. The study area encompasses the intersection of Thompson Drive / Allen Martin Drive and the intersection of Allen Martin Drive / Route 15. Based on the ITE trip generation for a General Light Industrial use and 37.20 developable acres in the commercial park, the traffic study estimates a total of 271 PM peak hour trips will be generated. The report concludes the proposed industrial park will not have an undue adverse impact on traffic on roads and highways within the study area, provided the applicant works with the Town and contributes to the planned capacity improvements at the Route 15 / Allen Martin Drive intersection. The report suggests a "fair share" traffic impact fee for the industrial park should be $28,800 ($191 per PM peak trip) for 151 Peak PM trips added to the Allen Martin Drive / Route 15 intersection.

2. *The traffic study shall also address the impact of heavy truck traffic on existing road conditions. Allen Martin Drive is #3 priority out of 179 paved road segments for improvements, Thompson Drive is #45 of 179 paved road segments and impacted portions of Sand Hill Road are #10. Allen Martin Drive was paved this summer as part of the Town pavement management plan; however, the other segments of roadway will be impacted by this development.*

   It is assumed that the new subdivided lots will house new facilities that are commercial or industrial in nature. Staff is of the opinion that these types of uses will create an additional structural impact on the deterioration of these two roadways, principally through the weight of the truck traffic. National studies have been done that indicate the structural impact from trucks is anywhere from 7 to 10 times greater than that of an automobile. Additional traffic impact fees will be assessed, as done in previous approvals within this corridor, to mitigate the effects of increased truck traffic.

The attached traffic report completed by Trudell Consulting Engineers does not include information regarding the impact of heavy truck traffic on the existing road conditions. VTRANS 2013 turning movement counts at the Allen Martin Drive / Route 15 intersection and the Allen Martin Drive / Sand Hill Rd intersection were used to estimate the percentage of heavy truck traffic produced by the existing industrial uses on Corporate Drive and Thompson Drive.

At the Allen Martin Drive / Route 15 intersection 53 trucks were recorded heading north bound on Allen Martin Drive and 52 trucks were recorded heading south bound on Allen Martin Drive. There were a total of 1801 vehicles heading north bound on Allen Martin Drive and 1775 vehicles heading south bound on Allen Martin Drive (see diagram below). The analysis shows the amount of heavy truck traffic on Allen Martin Drive is approximately 3% of the overall traffic in the area.

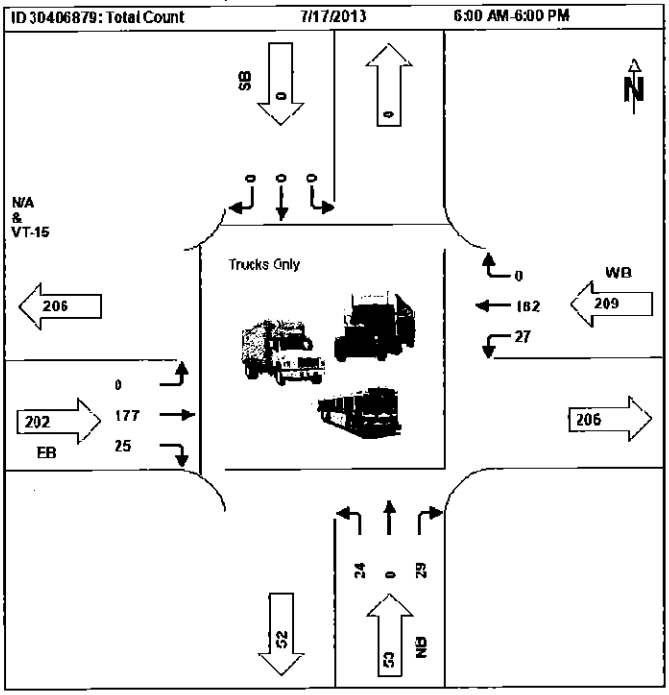
At the Allen Martin Drive / Sand Hill Road intersection 19 trucks were recorded heading west bound on Allen Martin Drive and 13 trucks were recorded heading east bound on Allen Martin Drive. There were a total of 572 vehicles recorded heading west bound on Allen Martin Drive and 723 vehicles recorded heading east bound on Allen Martin Drive (see diagram below). The analysis shows the amount of heavy truck traffic on Allen Martin Drive is approximately 2.5% of the overall traffic in the area.

By using the more conservative percentage of truck traffic found on Allen Martin Drive, of the 1,927 daily trips associated with the fully built out Industrial Park about 58 of the trips are expected to be heavy trucks (1,927 trips * 0.03 = 57.81 trips or 58 daily trips). During the PM peak hour, of the 271 trips created by the Industrial Park approximately 9 trips will be heavy trucks (271 trips * 0.03 = 8.13 trips or 9 trips).

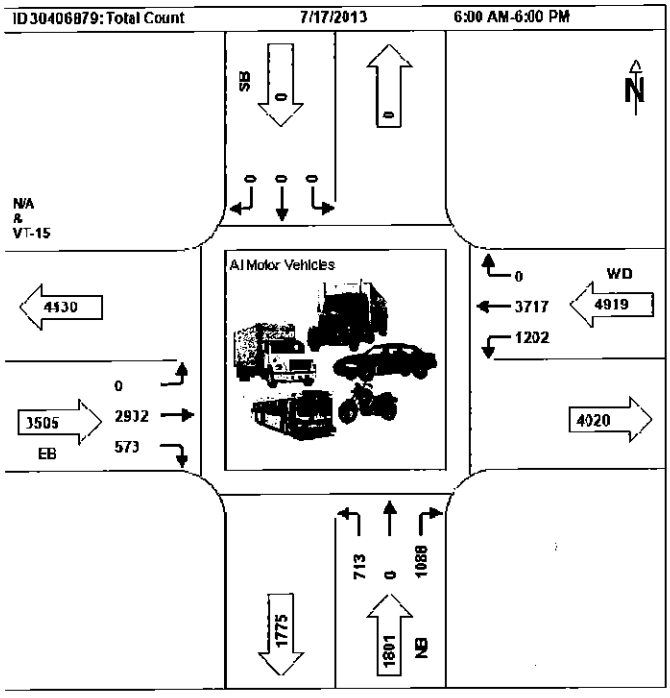
In 2013 the Town of Essex assessed a heavy truck road impact fee for each peak PM trip end. The fee was based on the percent volume impact on Thompson Drive and Allen Martin Drive. The percentage was then multiplied by the cost to add a 1.5 inch overlay on both of the roads. It is our opinion that the road maintenance fee should be done on a lot by lot basis based on the amount of truck traffic associated with each use.

<u>VTRANS Allen Martin Drive / Route 15 Turning Movement Counts</u>

Truck Traffic Only

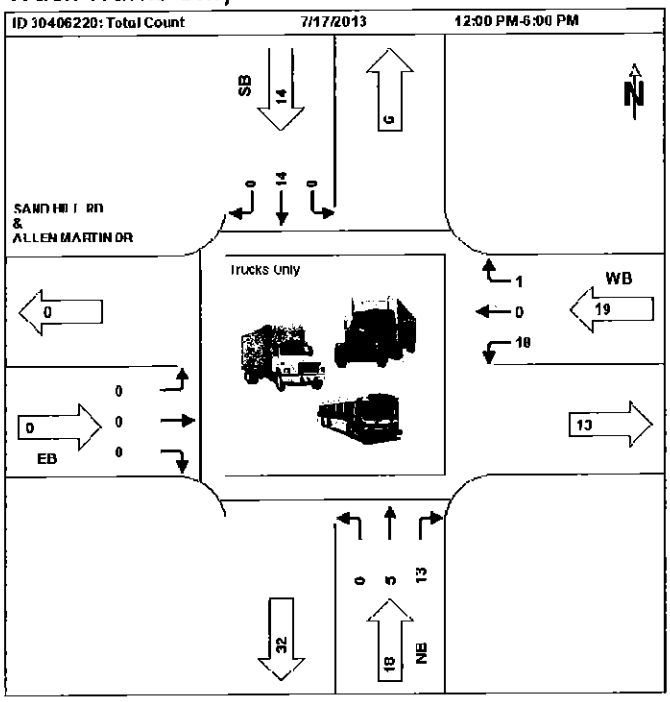


All Vehicles

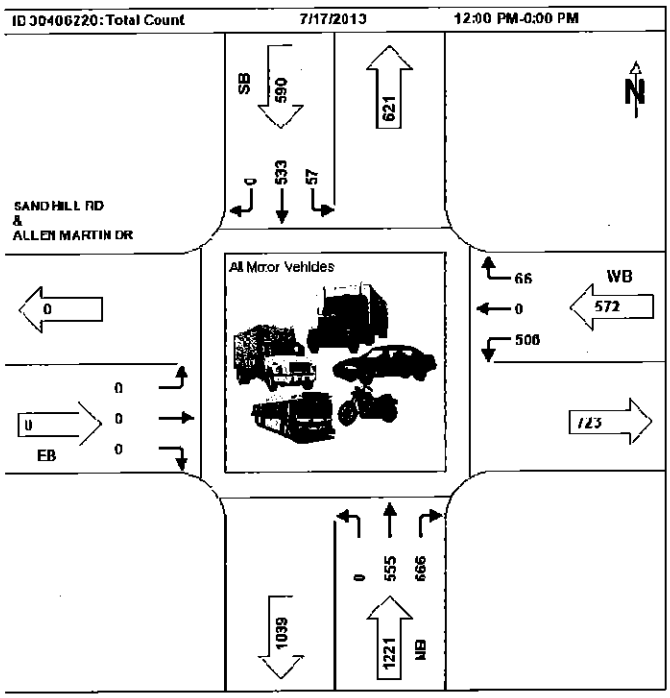


VTRANS Allen Martin Drive / Sand Hill Road Turning Movement Counts

Truck Traffic Only



All Vehicles



3. *Similar to previous project approvals on Thompson Drive, a paved turnaround at the end of the new Thompson Drive extension will be required to allow for Town Vehicles to turn around. No parking signs shall be erected at the turnaround and the land area for the turnaround shall be granted in an easement to the Town. This is necessary so that the No Parking Zone can be added to the Town Ordinance and the Police can enforce the No Parking. Furthermore, parking shall not be allowed along the length of Thompson Drive within the Town Right of Way. The applicant shall erect such signs at their expense at such time as the Town passes a No Parking Ordinance for this roadway.*

As part of this application a temporary parking lot is being constructed for the Town of Essex at the end of the Thompson Drive road extension. The parking lot is being proposed as the required turnaround at the end of Thompson Drive. The entrance into the parking lot is similar to the turnaround constructed at the end of the currently constructed Thompson Drive.

4. *Public Works is of the opinion that a secondary emergency access to Thompson Drive and the new 750-foot dead end public road be provided. The timing of this requirement will be dependent upon the traffic study and build-out of the project. No Exceptions.*

Please see page 7 for a sketch plan approval condition requiring all options for an immediate secondary emergency access to Thompson Drive.

Water/Sewer

1. *The 403 acre parcel noted as Lands of Allen Brook Development is located within the Town's sewer core and currently has 180 EU's, (36,000 GPD), of unpurchased sewer allocation within the Town's sewer system. Without knowing the future use for each of the proposed lots, proportioning in the sewer allocation throughout the subdivided parcels shown on Sheet 2 of the drawings is difficult. Staff recommends the applicant provide a list of potential uses within the new subdivision, with maximum sewer allocation for each lot, 1 through 6. The allocated 180 EU's are not guaranteed approved flows for the property. The number is an estimate to be fully evaluated and recalculated as projects are developed on undeveloped parcels.*

Based on the average water and sewer allocation of the lots on Corporate Drive each lot is estimate to have a 183 gpd of water demand per acre and 177 gpd of sewer demand per acre. Using these estimates the total commercial park allocation has been calculated in the table below. Please note the proposed Industrial Park does not represent all of the development potential within Parcel B.

Existing Allocation of Corporate Drive*

Corporate Drive	Business / Use	Lot Area (Acres)	Water Allocation (gpd)	Sewer Allocation (gpd)
Lot 1	Bellcate School	6.56	608	540
Lot 2	Regal Gymnastics	3.79	1,750	1,750
Lot 3	Sheet Metal Design	2.73	405	360
Lot 4	New England Deliveries	2.02	150	150
Lot 5	VIP	2.61	608	540
Lot 7-11	Revision Eyewear	7.03	1,980	1,980
Lot 13	O'Leary-Burke	4.72	225	225
Lot 14	Hector's Warehouse	2.65	270	270
Lot 15	Simpson Cabinetry	2.45	300	300
TOTAL		34.56	6,296	6,115

*Water and Sewer Allocation was taken from the best sources available

Water Allocation per Acre = 183 gpd = 6,296 gpd / 34.56 acres
Sewer Allocation per Acre = 177 gpd = 6,115 gpd / 34.56 acres

Allocation Estimate for the Proposed Industrial Park

Lot	Lot Area (Acres)	Water Allocation (gpd)	Sewer Allocation (gpd)
Lot 1	2.76	506	489
Lot 2	1.98	363	351
Lot 3	4.42	809	783
Lot 4	9.08	1,662	1,608
Lot 5	5.22	956	924
Lot 6	6.47	1,185	1,146
Lot 7	14.27	2,612	2,526
Lot 8	4.46	817	790
TOTAL	48.66	**8,910**	**8,617**

2. *Champlain Water District, (CWD) has a 0.65 MG tank located on Saxon Hill that provides sufficient water pressure and flow throughout the Forestdale Industrial Park. At this point, it does not appear that water capability will be a problem for either fire flow or domestic use but the proposed usage numbers and fire flow demands will be required at preliminary review.*

Please see the response to the previous comment for the water demand estimates for the Industrial Park. The fire flow demands will be dependent upon the size and use of each of the buildings. The fire flow demand could be as low as 500 GPM or it could be as high as 3,250 GPM (Reinhart Foodservice). As described in the comment, the fire flow capacity of the system in this area is exceptional.

Stormwater

1. *With the likelihood of the Town taking over maintenance responsibilities of any future onsite storm water treatment along Thompson Drive, it is staff's opinion that the applicants engineer investigates further storm water treatment options, such as in ground treatment and disposal.*

The idea of a single detention pond similar to Corporate Drive Phase II has been abandoned as part of the preliminary submittal. Due to the high infiltration rates found in the Adams Windsor sandy soils, a network of roadside dry wells have been proposed along the proposed Town roads. The stormwater system includes a total of ten 600 gallon dry wells with infiltration trenches to serve 1.77+/- acres of impervious coverage associated with the new roads and sidewalks. Pretreatment of the stormwater runoff, prior to infiltration, will be from an average of 390' of roadside swale leading into each of the drywell networks. The drywells have been sized for the 10-year storm event.

The temporary gravel parking lot on Lot #8 will be treated by a perimeter swale that has been sized to infiltrate the 10-year storm onsite. The swale has been designed with a 10' wide stone spreader for an overflow. The water will sheet flow across the existing woodland until reaching one of the existing drainage paths on the property.

2. *The revised TMDL for Lake Champlain will be issued in final form by EPA as well as the State of Vermont Implementation Plan. This will impact the design of all new storm water systems constructed in the Town as well as the need to retrofit others. Straight adherence to the State's 2002 Design guidelines will in all likelihood not meet the phosphorus removal requirements imposed on the Town. Every project will have to demonstrate a low level of phosphorus discharge and current pond design does not accomplish this to the degree that will be required. A combination of pretreatment for solids removal through products designed to accomplish this and infiltration or combination infiltration/gravel wetlands is the most likely approach that will receive approval from the Town. Consideration must be made now to move to these types of systems for any future project approvals. In effect a storm water pond as noted on the plans will not be approved by the Town where soils are conducive to infiltration or other forms of storm water treatment.*

The site is being designed to infiltrate all stormwater runoff up to the 10-year storm. According to the State of Vermont infiltrating all runoff up to and including the 1-year storm qualifies as a total phosphorus removal rate of 98%.

Sketch Plan Approval Conditions

1. *All construction shall be in conformance with the plans listed in Finding No IV(A) above and as may be amended subject to other conditions and approvals.*

No response necessary

2. *The Preliminary Plan submittal shall include recommendations from a professional forester regarding the placement of subdivision improvements and removal of trees, particularly the trees within the proposed 50-foot buffers.*

A site visit was conducted with Scott Moreau of Greenleaf Consulting Inc. on October 25, 2016. The attached letter is in regards to the placement of the subdivision improvements and removal of trees within the 50-foot buffers.

3. *The Preliminary Plan shall show the proposed locations of curb cuts, and the curb cuts shall be located as closely as possible to utility stubs.*

SH 1 – Overall Site Plan shows the general locations of the curb cuts along the new public roads. Since the road is not curbed the location of the "curb cuts" will change depending on the proposed layout for each lot. It is our opinion that the final location of the curbs cuts should be

determined during the Site Plan approval process for each lot. The utility stubs are generally located near the proposed curb cuts or areas where the road construction encroaches significantly within the 50' buffer. The utility stub locations are not under any of the curb cuts and take into account the minimum separation distances.

4. *The Preliminary Plan submittal shall include a traffic study with the details requested by Public Works in the memorandum dated October 2, 2015.*

The traffic study has been addressed on page 2.

5. *The Preliminary Plan shall show options for a secondary, emergency access to Thompson Drive.*

The secondary emergency access to Thompson Drive is being proposed off Saxon Hill Rd, as shown on SH 1 – Overall Site Plan. The emergency access road is an existing dirt road and is approximately 10-12' +/- wide. The road will be widened to a minimum of 14'. About 520' of the road from the end of Saxon Hill Road is already used and maintained by the Town of Essex to access the water tank. The remaining 1,150 ft +/- of the existing road is currently used to access and maintain a 12" water main and overhead power lines. The 2011 Town Plan shows the proposed emergency access road as a combination of Class 3 and Class 4 Town Highways. A site visit with the fire department may be helpful to address the condition of the existing road.

Another option for a secondary access road will be provided with the site plan application for Lot #5, which is not part of this preliminary application. The rear of Lot #5 is part of the 200' residential buffer from the right-of-way on Saxon Hill Road. The buffer in this area, however, is mainly an open field and will not provide the screening that neighbors are accustom to seeing in the RPD-I zoning district. The proposed screening will be to construct two 5-9 foot high parallel berms with evergreen plantings on top for extra screening. The secondary emergency access road will be proposed in between the two berms as shown on the Lot #5 sketch provided.

6. *The Preliminary Plan submittal shall include proposed water usage numbers and fire flow demands.*

The estimated water usage numbers and fire flow demands have been addressed on page 6 and below.

7. *The Preliminary Plan submittal shall include a design of a water supply system that satisfies the Fire Chief and Public Works for fire protection purposes.*

The development will be served by an existing 12" ductile iron water main connected to the water tank on Saxon Hill. The existing main has proved to produce exceptional fire flows and the water supply system includes hydrants at least every 500'. A flow test was done with the State Fire Marshal and DPW in August 2014 on the existing 12" in front of the Reinhart Food

Service building. The line flowed at least 3,250 GPM through a combination of two hydrants and had a residual pressure of 44 psi.

8. *The Preliminary Plan submittal shall include an estimate of future sewer usage for each lot.*

The estimated sewer usage numbers have been addressed on page 6.

Please find the following information attached

1) Total Preliminary Subdivision & Site Plan Review Fees: **$273.70**
    a. $125 Preliminary Subdivision Fee
    b. $6.465/ abutter * ~~23~~ 27 abutters = ~~$148.70~~ 174.56
2) Nine (9) sets of plans
    a. Three (3) full size sets
    b. Six (6) 11x17 sets
3) Abutter list & three (3) sets of mailing labels
4) Signed Planning and Zoning Application
5) Traffic Report by Trudell Consulting Engineers
6) Lot #5 Sketch Plan showing an additional option for secondary access
7) Lands of Allen Brook Development Subdivision Plat dated 2/3/16 by Trudell Consulting Engineers
8) Letter from Professional Forester Scott Moreau, Greenleaf Consulting, Inc.

If you have any question or need additional information, please let me know.

Sincerely,

Bryan Currier

Bryan Currier, PE

TRAFFIC IMPACT STUDY

TCE# 15-043| Thompson Drive Sand Extraction & Industrial Park
ESSEX, VERMONT

Date:
June 7, 2016

Prepared For:
Allen Brook Development

Prepared By:
Abigail Dery, P.E.

TRUDELL CONSULTING ENGINEERS tce

478 BLAIR PARK ROAD, WILLISTON, VT 05495 | 802 879 6331 | WWW.TCEVT.COM

TABLE OF CONTENTS

I. Introduction.....1
II. Existing Conditions.....1
A. Geometries and Speed Limit
B. Public Transportation
C. Bicycle and Pedestrian Facilities
III. Proposed Project.....2
A. General Description
B. Layout/Circulation
C. Project-Generated Traffic
D. Proposed Pedestrian Facilities
IV. Traffic Volume.....4
A. Existing Traffic Data – AADT, DHV, and Growth Factors
B. Traffic Projection Scenarios
C. Traffic Counts & Calculations
V. Capacity and Warrant Analysis.....5
A. Level of Service
B. Auxiliary Turn Lanes
VI. Safety Analysis.....8
A. VTrans High Crash Locations
B. Sight Distance
VII. Summary of Findings.....8
VIII. Impact Mitigation Recommendations.....9
A. Access Management Improvements
B. Public Transportation, Pedestrian, and Bicycle Facilities
C. Roadway Maintenance
D. Monitoring Conditions

Appendices

A. Location Map
B. Turning Movement Diagrams – Allen Martin Drive & Thompson Drive
C. Turning Movement Diagrams – VT 15 & Allen Martin Drive
D. HCM 2010 Analysis
E. Crash Analysis

I. Introduction

Allen Brook Development is proposing a 27.5 acre sand extraction area located on a 162.76 acre parcel of land identified as "Parcel B" off the end of Thompson Drive in Essex, Vermont. Additionally, an 8-lot industrial subdivision is proposed for a portion of the remaining Parcel B. The following Traffic Impact Study has been prepared to identify the impact of project-generated traffic on the adjacent roadway network, in accordance with Vermont Agency of Transportation (VTrans) guidelines and methodology. The study area encompasses the intersection of Thompson Drive and Allen Martin Drive, and the intersection of VT Route 15 and Allen Martin Drive.

II. Existing Conditions

A. Geometrics and Speed Limit

Located at the termination of the dead-end Thompson Drive, the existing parcel is currently vacant and largely forested. There had been a sand extraction operation on the parcel that has since been discontinued. Thompson Drive intersects Allen Martin Drive approximately 0.3 miles south of VT Route 15. See Appendix A – Location Map for an aerial view of the project site and how it relates to surrounding roadways.

Thompson Drive is a local road serving several existing light industrial businesses including Autumn Harp and Reihnart Foodservice. Allen Martin Drive, an urban collector with a 35 mile per hour (mph) speed limit, connects Sand Hill Road to VT Route 15. VT 15 is classified by VTrans as an urban principal arterial with a posted speed of 40 mph. For the purpose of this report, VT 15 will be referred to as running east/west, and

Allen Martin Drive will be north/south. Allen Martin Drive meets VT 15 at a T-intersection with stop control on Allen Martin Drive. There is an exclusive right-turn lane on eastbound VT 15 at this intersection. To the south, Thompson Drive meets Allen Martin Drive at a T-intersection.

B. Public Transportation

There are currently no regularly scheduled public transportation facilities on Allen Martin Drive. There is a Chittenden County Transit Authority (CCTA) commuter route that follows VT 15, but stops only at the Essex Outlets to the west of the project and Jericho Village to the east. Another Essex Center Route follows Sand Hill Road, which intersects Allen Martin Drive approximately 0.5 to the south of Thompson Drive.

C. Bicycle & Pedestrian Facilities

There is an existing pedestrian path that follows the east side of Allen Martin Drive. Additionally, an existing paved path runs along the south side of Thompson Drive from Allen Martin Drive approximately 0.5 miles, terminating at the point where Thompson Drive takes a sharp turn to the south.

III. Proposed Project

A. General Description

Two separate projects are identified in this report, the first is identified as "Phase 1 – Sand Extraction", which consist of permitting a 27.5 acre sand extraction operation on Parcel B at the end of Thompson Drive. The second project is identified as "Phase 2 – Industrial Subdivision", which consists of an eight lot subdivision, with lots in the 2 to 10 acre range intended for general light industrial uses.

B. Layout/Circulation

Access to the sand extraction operation will be via an existing private road located at the end of Thompson Drive. The industrial park lots will be accessed either via directly from Thompson Drive or via a proposed dead-end street intersecting the north/east side of Thompson Drive. A secondary access to the industrial park is a requirement of the Town of Essex, and will be via an emergency vehicle only driveway through Lot 5 to Sand Hill Road to the east. This road will be gated and only open for emergency use.

C. Project-Generated Traffic

Phase 1 - Sand Extraction

The applicant is proposing to permit an average of 60 truckloads and a maximum of 200 truckloads of sand daily. Base on this extraction rate, average hourly vehicle trips will be between 5-10 trips, with a maximum hourly trip rate of 40 vehicles. Hours of operation will be such that the maximum hourly trip rate will not coincide with the PM Peak hour of traffic. 10 PM Peak hour trips are proposed for this project.

Phase 2 - Industrial Park

Project-generated traffic for the industrial park is calculated using the Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition. The ITE use most resembling the project is 110 – General Light Industrial, which is described as "free-standing facilities devoted to a single use...typically having minimal office space...and including activities such as printing, material testing, and assembly of data processing

equipment." Based on a useable 37.2 acres, the proposed industrial subdivision is estimated to generate 271 PM peak hour trips. The table below outlines the anticipated PM peak hour project-generated traffic volume for both Phase 1 and Phase 2.

Table 1: *PM Peak Hour Project-Generated Traffic Volume*

	Lot	Land Use	Acreage	ITE	Rate	Trips	Entering	Exiting
Phase 1	Parcel B	Sand Extraction*	27.5 AC	N/A	10 PM Peak Hr Trips	10	6	4
Phase 2	1-8	Light Industrial*	37.20 AC	110	7.26 trips/ acre	271	60	211
					TOTAL	**281**		

*max 10 trips PM peak and 40 max trips/hr off peak
**Developable area less buffers and ROW

Distribution of vehicle trips from project-generated traffic was determined using analogy to the short count and commuting patterns. The diagrams below illustrate the estimated turning movement distribution at the study intersections.

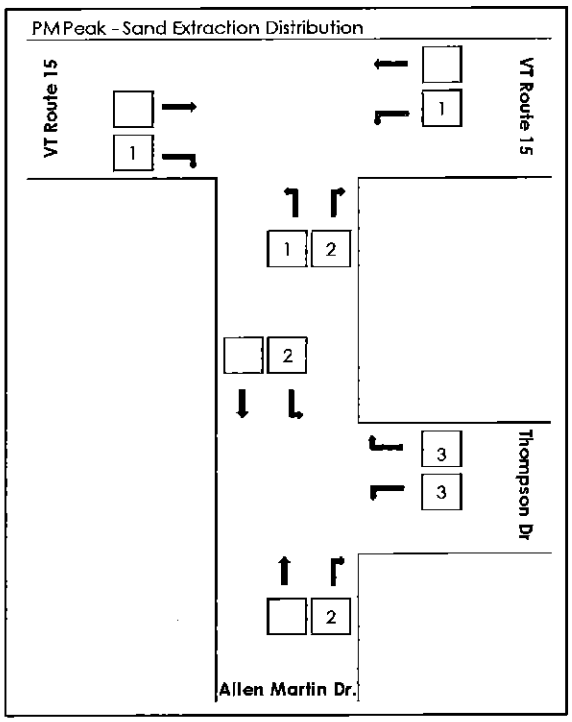


Figure 1: *Phase 1 Distribution*

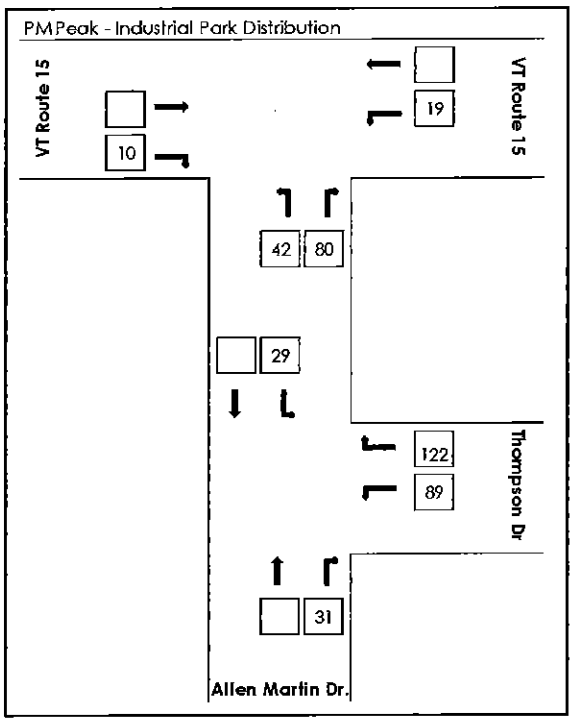


Figure 2: *Phase 2 Distribution*

D. Proposed Public Transportation and Pedestrian Facilities

No new public transportation or pedestrian facilities are proposed for the project. The proposed light industrial uses will generally not be accessed by the public. Employees will use existing pedestrian infrastructure on Thompson Drive and Allen Martin Drive.

IV. Traffic Volume

A. Existing Traffic Data – AADT, DHV, and Growth Factors

According to VTrans ATR Station D121, located on VT Route 15 to the east of the Allen Martin Drive intersection, VT 15 has an Average Annual Daily Traffic (AADT) volume of 10,900 vehicles per day (vpd). An AADT of 3290 vpd was recorded on Allen Martin Drive to the south of the VT 15 intersection in 2013. The design hour volumes (DHV) for each road were calculated using the "k" value from VTrans' *DHV Determination Based on AADTs and Highway Class-General Highway* for Urban Highways.

Urban highways in Vermont have not experienced significant growth over the past 10 years, according to the VTrans Continuous Traffic Counter Grouping Study and Regression Analysis (2014). A growth factor of 0.99 was applied to the recorded 2013 AADT to adjust for current conditions. No growth factor was applied to the background traffic to project the 2021 traffic volumes.

Table 2: *Background Traffic Volume – AADT and DHV*

	Station	2013 AADT	Growth Factor	K factor	2016 & 2021 DHV
VT 15	S6D121	8700	0.99	0.1061	1145
Allen Martin Dr.	DYAE	3290	0.99	0.1061	346

B. Traffic Projection Scenarios

Traffic impact was analyzed for a weekday design hour scenario, which occurs during the afternoon peak, generally between 4:30-5:30 PM. Both unsignalized intersections within the study area were analyzed – VT 15/ Allen Martin Dr and Thompson Drive/Allen Martin Drive. Each scenario assumes the existing intersection geometry will be in place. The analyzed scenarios include:

- 2016 No-Build: Background traffic plus other development traffic
- 2016 Phase 1 Build: No-Build plus Phase 1 (Sand Extraction) traffic
- 2016 Phase 2a Build: No-Build plus Phase 1 and 50% Phase 2 (Industrial Park) traffic

- 2021 No-Build: Background traffic plus other development traffic
- 2021 Build: No-Build plus Phase 1 and Phase 2 (Industrial Park) traffic
- 2021 Build w/ Mitigation: includes left turn lanes on VT 15 and Allen Martin Dr.

C. Traffic Counts & Calculations

Trudell Consulting Engineers performed a manual Turning Movement Count (TMC) at the Thompson Drive/Allen Martin Drive intersection on 5/11/2016 to determine existing background traffic distribution. A turning movement count conducted by VTrans on 6/19/2013 as used for the VT 15/ Allen Martin Drive analysis. These counts indicate that the overall PM peak hour for the area occurs between 4:30 to 5:30 PM. Turning movement short counts were adjusted to correspond to the DHV for VT 15 and Allen Martin Drive.

V. Capacity and Warrant Analysis

A. Level of Service

Vehicle delay, level of service (LOS), volume to capacity ratio (v/c ratio), and 95th percentile queue length were calculated at the intersections using Synchro8 w/ 2010 HCM methodology. A peak hour factor of 1.0 with a 60 minute analysis period was used, as recommended by VTrans. Level of service grades correspond directly to a range of vehicular delay at intersection approaches. The following table describes the delay range, in seconds per vehicle, for each grade of LOS.

Table 3: *Level of Service Descriptions*

Level of Service	Control Delay (s)
A	≤ 10
B	>10 and ≤ 15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Allen Martin Drive and Thompson Drive

The tables below show the results of the analysis for each intersection. As indicated in the tables, the intersection of Thompson Drive and Allen Martin Drive has adequate capacity for the addition of project-generated traffic through 2021 for Phase 1 Sand, Phase 2a, and the full Phase 2 Industrial Park. Level of service on the stop controlled project driveway remains a C or better for all approaches under "Build" conditions.

Table 4: *Phase 1 LOS Analysis - Allen Martin Drive & Thompson Drive*

	2016 No-Build				2016Phase 1 Build			
	Approach Delay (s)	*LOS*	*v/c ratio*	*Queue (veh)*	*Approach Delay (s)*	*LOS*	*v/c ratio*	*Queue (veh)*
Westbound (Thompson)	11.4	B	0.132	0.5	11.5	B	0.142	0.5
Southbound (Allen Martin)	7.9	A	0.006	0	7.9	A	0.008	0

Table 5: *Phase 2a LOS Analysis - Allen Martin Drive & Thompson Drive*

	2016 Phase 2a Build			
	Approach Delay (s)	*LOS*	*v/c ratio*	*Queue (veh)*
Westbound (Thompson)	13.4	B	0.315	0.5
Southbound (Allen Martin)	8.0	A	0.020	0.1

Table 6: *Phase 2 LOS Analysis – Allen Martin Drive & Thompson Drive*

	2021 No-Build				2021 Build			
	Approach Delay (s)	*LOS*	*v/c ratio*	*Queue (veh)*	*Approach Delay (s)*	*LOS*	*v/c ratio*	*Queue (veh)*
Westbound (Thompson)	11.4	B	0.132	0.5	16.8	C	0.499	2.9
Southbound (Allen Martin)	7.9	A	0.006	0	8.0	A	0.032	0.1

VT Route 15 and Allen Martin Drive

Traffic from the Phase 1 sand extraction operation has minimal impact on the VT 15/Allen Martin Drive intersection operation. Delay will increase by about 1 second and less than 1 vehicle is added to the vehicle queue.

The Phase 2a scenario, which includes traffic from a 50% build-out of the industrial park, results in minimal impact to VT 15 flow. There is a 15 second increase in delay at the Allen Martin Drive approach for left-turning vehicles, but only 3 vehicles are added to the queue and volume capacity is less than 1.

The LOS analysis indicates that impacts to the Allen Martin Drive approach by the full Phase 2 industrial park traffic will consist of increased delay and vehicle queueing, without any mitigation. Installing a longer right turn lane could reduce the vehicle queue at this approach. Additionally, a planned but not yet constructed left-turn lane

on westbound VT 15 would also improve traffic flow on VT 15. Results of the mitigation scenario analysis are outlined in Table 10 below.

Table 7: *Phase 1 LOS Analysis – VT 15 & Allen Martin Drive*

	2016 No-Build				**2016 Build**			
	Approach Delay (s)	*LOS*	*v/c ratio*	*Queue (veh)*	*Approach Delay (s)*	*LOS*	*v/c ratio*	*Queue (veh)*
Northbound R (Allen Martin)	19.1	C	0.528	3.3	19.2	C	0.531	3.3
Northbound L (Allen Martin)	49.8	E	0.652	5	50.9	F	0.659	5.1
Westbound (VT 15)	8.9	A	0.094	0.3	8.9	A	0.094	0.3

Table 8: *Phase 2a LOS Analysis – VT 15 & Allen Martin Drive*

	2016 Phase 2a Build			
	Approach Delay (s)	*LOS*	*v/c ratio*	*Queue (veh)*
Northbound R (Allen Martin)	21.8	C	0.606	4.4
Northbound L (Allen Martin)	75.7	F	0.785	8.1
Westbound (VT 15)	9.0	A	0.104	0.3

Table 9: *Phase 2 LOS Analysis - VT Route 15 & Allen Martin Drive*

	2021 No-Build				**2021 Build**			
	Approach Delay (s)	*LOS*	*v/c ratio*	*Queue (veh)*	*Approach Delay (s)*	*LOS*	*v/c ratio*	*Queue (veh)*
Northbound R (Allen Martin)	19.2	C	0.531	3.3	25.5	D	0.68	6
Northbound L (Allen Martin)	50.9	F	0.659	5.1	133.6	F	0.917	13.1
Westbound (VT 15)	8.9	A	0.094	0.3	9	A	0.113	0.4

Table 10: *Phases 2 LOS Analysis – VT 15 & Allen Martin Drive – with mitigation*

	2021 Build			
	Approach Delay (s)	*LOS*	*v/c ratio*	*Queue (veh)*
Northbound L (Allen Martin)	116.1	F	0.892	12
Northbound R (Allen Martin)	25.5	D	0.68	6
Westbound L (VT 15)	9.0	A	0.113	0.4

B. Auxiliary Turn Lanes

Prior area traffic studies have indicated that a left turn lane on VT 15 at the Allen Martin Drive intersection is warranted. The Town of Essex has been collecting funds for this improvement in the form of Traffic Impact Fees. The Town has historically used a project cost of $300,000 and determined share based on proposed peak hour trip generation.

- Sand Operation: The project will add 5 PM peak hour trips to the intersection, which equates to 0.35 % of peak hour traffic. $300,000 * 0.35% = $1,055
- Industrial Subdivision: The project will add 151 trips to the intersection, which equates to 9.6% of peak hour traffic. $300,000 * 9.6% = $28,800

No additional turn lanes are warranted at the Thompson Drive/Allen Martin Drive intersection at this time.

VI. Safety Analysis

A. VTrans High Crash Locations

The most recently published VTrans *High Crash Location Report (2010-2014)* does not identify the intersection of VT 15 and Allen Martin Drive as a High Crash Location, or sections east of VT 128 in Essex as High Crash Sections.

Eight crashes occurred at the intersection of VT 15 and Allen Martin Drive during the period from 1/1/2010 to present, as recorded by VTrans. The calculated crash rate of 0.347 crashes/million entering vehicles (cr/MEV) is lower than the critical crash rate of 0.947 cr/MEV and therefore this intersection would not be considered a High Crash Location.

B. Sight Distance

No new driveways or intersections are proposed. Existing sight distance at both the VT 15/ Allen Martin Drive and the Allen Martin Drive/Thompson Drive intersections are adequate.

VII. Summary of Findings

Based on review and analysis of the existing and proposed traffic conditions, the following conclusions are presented:

1. The proposed Allen Brook Development projects are located at the end of Thompson Drive, which intersects Allen Martin Drive approximately 0.3 miles south of VT 15. The sand extraction operation will have access to Thompson Drive via a

private driveway. The 8 lots within the industrial subdivision will either have direct access to Thompson Drive or via a new private dead-end road.

2. Sand extraction will generate approximately 10 PM peak hour vehicle trips.

3. Based on ITE Trip Generation, the industrial park could generate approximately 271 PM peak hour vehicle trips.

4. LOS – Thompson Drive/Allen Martin Drive: Level of Service on Allen Martin Drive will remain an A with the addition of project-generated traffic from both the sand extraction and the industrial park. LOS on the Thompson Drive approach will be a C or better for all scenarios.

5. LOS – Allen Martin Drive/ VT Route 15: Delay and queueing is minimally impacted by the addition of trucks from the proposed sand extraction operation. The increase in traffic from the proposed industrial park will increase delay and queuing on the Allen Martin Drive approach. Traffic volume on VT 15 is high under the 2021 No-Build scenario, limiting the number of acceptable gaps in flow for new entering vehicles.

6. The intersection of VT 15 & Allen Martin Drive is not listed in the VTrans High Crash Location Report. Additionally, this area of VT 15 is not identified as a High Crash Section.

7. The proposed sand extraction project will not have an undue adverse impact on traffic on roads and highways within the study area. The proposed industrial park project will not have an undue adverse impact on traffic on roads and highways within the study area, provided they work with the Town and contribute to the planned capacity improvements at the VT 15/Allen Martin Drive intersection.

VIII. Impact Mitigation Recommendations

A. Intersection Improvements and Traffic Impact Fee/Fair Share Mitigation

The intersection of VT Route 15 and Allen Martin Drive can experience PM peak hour delay due to high volume in background traffic. The addition of the small amount of PM peak hour trips from the sand extraction operation does not significantly impact operations at this intersection. The industrial subdivision will add a larger volume of traffic to this intersection, and thus, we concur with prior studies that the left-turning lane on VT 15 is warranted.

The Chittenden County Regional Planning Commission has commissioned a Unified Planning Work Program (UPWP) study to evaluate the long term traffic impacts to the VT

15/Allen Martin Drive intersection. The study will include traffic from the proposed projects, however, will not be completed until late 2016, at best. The Town of Essex has been collecting traffic impact fees to fund future improvements to the VT 15/Allen Martin Drive intersection.

Payment of this percentage of mitigation costs for the VT 15/Allen Martin Drive intersection should satisfy both Act 250 "fair share" fee requirements as well as the traffic mitigation portion of the Town of Essex traffic impact fee.

- Sand Operation: The project will add 5 PM peak hour trips to the intersection, which equates to 0.35 % of peak hour traffic. $300,000 * 0.35% = $1,055
- Industrial Subdivision: The project will add 151 trips to the intersection, which equates to 9.6% of peak hour traffic. $300,000 * 9.6% = $28,800

B. Roadway Maintenance

In addition to the traffic mitigation fee, the Town of Essex assesses a fee based on the truck weight impact on Thompson and Allen Martin Drive.

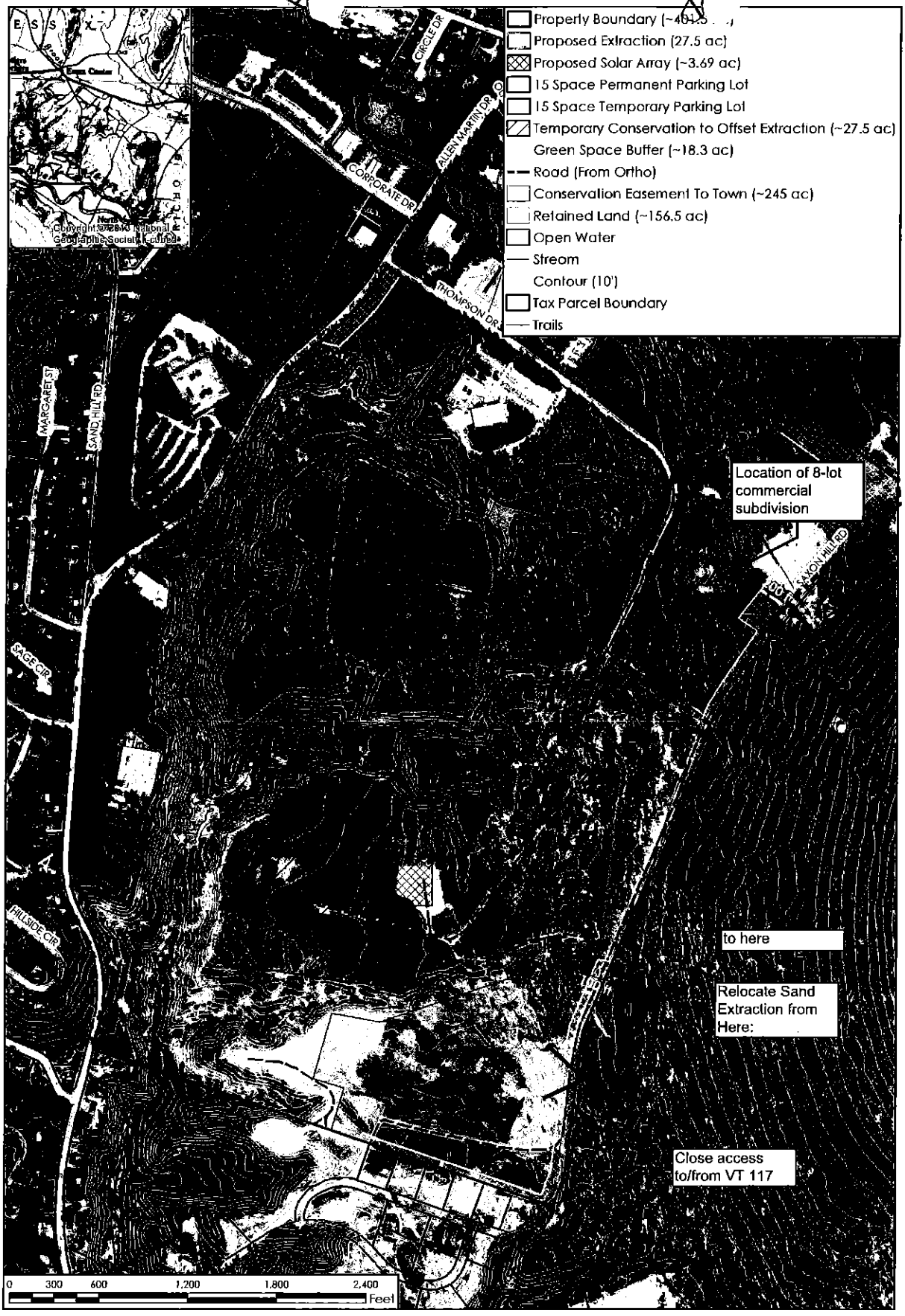
- Sand – The applicant is requesting a PM peak hour volume of 10 vehicle trips, which represents 8.5% of the total peak hour volume on Thompson Drive, and 2.0% of peak hour traffic on Allen Martin Drive.
- Industrial Park – The applicant is requesting a PM peak hour volume of 271 vehicle trips, which will represent 71.1% of the total peak hour volume on Thompson Drive, and 41.5% of peak hour traffic on Allen Martin Drive.

C. Recommended Transportation Demand Management measures

To minimize impacts to area traffic during peak traffic hours, it is recommended that proposed industrial park businesses implement Transportation Demand Management measures, such as options for staggered shifts and incentives for carpooling.

D. Monitoring Conditions

No immediate monitoring conditions are recommended, however, project-generated traffic should be identified as each industrial lot is permitted and constructed.



TRUDELL Consulting Engineers
802.879.6551 www.tcevt.com

Saxon Hill
Allen Brook Development
Essex, VT

Overall Development Map
Exhibit A

Project: 15-043
Prepared By: LMJ
06/22/2015
1 inch = 600 feet

Sources: Bing Aerial Photography and Bing Bird's Eye View (2012); Streams by ANR (2012); Project Area by TCE (2014); VT E911 Roads (2011); Tax Parcel Boundary compiled by VCGI; Conservation Easement, Temporary Conservation, Parking Lot, Green Space Buffer, Proposed Solar Array, Future ROW by TCE (2015); Contours by CCRPC (2009);

Disclaimer: The accuracy of information presented is determined by its sources. TCE is not responsible for any errors or omissions that may exist. Questions of on-the-ground location can be resolved by site inspections and/or surveys by a registered surveyor. This map is not a replacement for surveyed information or engineering studies.

PO Box 39
Westford, Vermont 05494

802-849-6629 office
802-343-1566 cell

GLForestry@aol.com
www.GLForestry.com

November 1, 2016

Ms. Sharon Kelly
Zoning Coordinator
Town of Essex Junction

Dear Sharon,

I hope this letter finds you well.

On Tuesday October 25, 2016 I met with Brian Currier of O'Leary and Burke who is representing Allen Brook Development Inc. in its effort to develop **"Forestdale Industrial Park – 8 Lot Subdivision".**

We discussed the issue of how to best retain trees and or landscaping along the sides of the road system for the proposed Davison Drive and Thompson Drive and within the 50 foot buffers.

Unlike the areas that you and I have worked together on along Corporate Drive this area has had extensive cutting for the re-growth of a new forest crop. The result of the cutting is that the majority of the areas have significant regeneration of well established trees ranging from 1 to 4 inches in diameter (at caliper, six inches above the ground)) and from 2 to 15 feet in height. These trees are well established and very healthy. These trees, after the clearing takes place for the infrastructure required to complete the development, will be the basis for the trees needed to protect the 50 foot buffers and to be retained along the edges of the roads AFTER the infrastructure has been built out.

My plan is to let the infrastructure be built as needed and then to flag specific retain trees throughout the buffers and along the edges of the infrastructure and also the edges of the areas not in need of clearing during the timeline of the complete build out.

I can assure you that there will be more than ample trees to meet the implied intent of the buffers and to retain a treed environment where there will be no development.

Should you have any further questions about the tree issues for this particular project please do not hesitate to contact me.

Thank you,

Sincerely,
Scott E. Moreau
Scott E. Moreau

File @ Sde
Prelim

MEMORANDUM

TO: Selectboard
Patrick C. Scheidel, Town Manager
Douglas Fisher, Director of Administrative Services
FROM: Sharon Kelley, Zoning Administrator SK
CC: Shannon Lunderville, GIS Coordinator
Charles Cole, Fire Chief
DATE: November 17, 2016

RE: **31 ALLEN MARTIN DRIVE, ESSEX, VT**

ISSUE:

The Select board must approve street names after a review has been completed by the E911 Coordinator.

The applicant, Al Senecal, is in the process of Planning Commission preliminary plan review for an 8-lot subdivision located off Thompson Drive. This will require a new public cul-de-sac road – which will require an approved street name. We have asked the applicant for suggested street names in the event the project receives final approval.

Mr. Senecal has submitted the following three names, listed by preference, for your consideration:

1. Davision Drive (1st choice);
2. Saxon Woods Lane; and
3. Red Pine Circle.

DISCUSSION:

The first two names have been rejected by the E911 Coordinator and the Fire Chief because they conflict and/or sound similar to existing street names. Currently, existing street names sounding similar are David Drive, Saxon Hill Road, and Saxonhollow Drive. In addition, the whole area is referred to as Saxon Hill.

The E911 Coordinator and Fire Chief approve the name Red Pine Circle. The applicant is agreeable to this name.

COST:

The landowner will be required to purchase the street sign.

RECOMMENDATION:

It is recommended that the Select board adopt 'Red Pine Circle' as the street name for the proposed new public.

Sharon Kelley

From: Shannon Lunderville
Sent: Wednesday, November 16, 2016 4:00 PM
To: Sharon Kelley
Subject: RE: Senecal St names

Sharon,

We would need to go with choice # 3 - Red Pine Circle.
The proposed street names of Davison Drive and Saxon Woods Lane cannot be approved as they are not in compliance with E911 naming standards.
The State of Vermont E911 Handbook (appendix I section 3 (road naming)) :

b) there should be no duplicate street names
c) there should be no identical and similar sounding street names

At this time there are already many (grandfathered) sound-a-likes to the proposed names - David Drive, Saxon Hill Road, Saxonhollow Drive, as well as the fact that the whole area there is referred to as Saxon Hill, Saxon Hill Industrial Park, etc.

In this age of growing communities and concerns for overall safety we should be protecting our current and future residents from any chance at all of becoming a victim of error or disaster.
It only takes one second for an error when someone calls for an emergency and they are confused, disoriented, or the drivers that are responding become disoriented because the names of the streets sound too much alike, or it is too dark out, etc. Imagine if someone died or lost their property because of the naming error.
It is these instances we must avoid and to do this we must keep planning so that there will be no confusion. It is our job as officials and developers to protect our residents and business owners, they are counting on us.

If the applicants really do not wish to go with choice #3 we have a list available of all of the current names, suggested acceptable names, or by all means they could definitely get creative or historical and submit another (probably a couple).

Thanks to all for their cooperation in this matter.
~ Shannon

Shannon L. Lunderville, GISP
GIS Coordinator / E911 Coordinator

Town of Essex
81 Main Street
Essex Jct., VT 05452
slunderville@essex.org
802-878-1343

From: Sharon Kelley
Sent: Wednesday, November 16, 2016 3:23 PM
To: Shannon Lunderville

O'Leary-Burke Civil Associates, PLC

CIVIL ENGINEERING | REGULATORY AND PERMIT PREPARATION | LAND SURVEYING | CONSTRUCTION SERVICES | LAND USE PLANNING

November 18, 2016

Greg Duggan, Town Planner
Town of Essex, VT
81 Main St. Essex Jct., VT

RE: 31 Allen Martin Drive, Essex
Forestdale Industrial Park, Thompson Drive, Essex, VT
Preliminary Subdivision Application – **Incomplete Notice Response**

Dear Greg:

We are writing on behalf of Allen Brook Development Inc. c/o Al Senecal in response to the incomplete notice dated November 17, 2016 for the preliminary subdivision application at 31 Allen Martin Drive. The letter requested the following information:

1) *The site plan must show the deer yards and contiguous habitat included in the Town Plan's Significant Features map.*

The site plan has been revised to show the limits of the deer yards, contiguous habitat, and core habitat as shown on the Town of Essex Significant Features map.

2) *Preliminary Plat*

A preliminary plat has been attached.

3) *Is any lighting being proposed on the new streets?*

No lighting is being proposed with the preliminary application. There are no street lights in the adjacent Corporate Drive Commercial Park and there are no street lights on the most recent Thompson Drive extension. The original section of Thompson Drive, however, does have street lights mounted about every other GMP utility pole. If it is deemed necessary to provide lighting consistent with the original Thompson Drive it will have to be approved by GMP.

If you have any question or need additional information, please let me know.

Sincerely,

Bryan Currier

Bryan Currier, PE

13 CORPORATE DRIVE ESSEX JUNCTION VERMONT 05452
TEL 802 878 9990 | FAX 802 878 9989 | obca@olearyburke.com

Gregory Duggan

From: Bryan Currier <bcurrier@olearyburke.com>
Sent: Wednesday, November 30, 2016 8:27 AM
To: Gregory Duggan
Cc: Brian Bertsch (bbertsch@omegavt.com)
Subject: RE: Questions for Allen Brook subdivision

Hey Greg

- What are the lot frontages on the cul-de-sac for Lots 3 and 4?
Lot 3 = 215.8'
Lot 4 = 200.1' (Cul-De-Sac)
= 782.5' (Saxon Hill Rd)

- What is the diameter of the cul-de-sac? I'm measuring the diameter of the cul-de-sac at 90 feet; the regs call for a 100-foot diameter.
I got 90' too. I will revise the plans to show a 100' diameter cul-de-sac.

- Do you know the reason for the discrepancy in sewer use numbers between what you provided (177 gpd) and Public Works (182.2 gpd)?
Public works used the water allocation numbers instead of the sewer numbers. I am currently working on our response to the public works memo where I am going to address the allocation portion of their comments. I hope to have it to you today.

Let me know if you have any additional questions.

Thanks,
Bryan

From: Gregory Duggan [mailto:gduggan@ESSEX.ORG]
Sent: Tuesday, November 29, 2016 6:46 PM
To: Bryan Currier
Subject: Questions for Allen Brook subdivision

Bryan,

A few quick questions for the 8-lot subdivision:

- What are the lot frontages on the cul-de-sac for Lots 3 and 4?
- What is the diameter of the cul-de-sac? I'm measuring the diameter of the cul-de-sac at 90 feet; the regs call for a 100-foot diameter.
- Do you know the reason for the discrepancy in sewer use numbers between what you provided (177 gpd) and Public Works (182.2 gpd)?

Thanks,
Greg

Jennifer Booker

Sent 11/2/16
beberta, B Carter

From: Essex Fire Chief <ccole183@comcast.net>
Sent: Wednesday, November 02, 2016 10:39 AM
To: Jennifer Booker
Cc: Aaron Martin; Allyson Vile; Brad Larose; Dana Hanley; Daniel Gregoire; Dennis Lutz; Gregory Duggan; jim Jutras; Robin; Sharon Kelley
Subject: Re: 31 Allen Martin Drive

Hi All,

I have no objections to these plans as submitted provided that they meet with the approval of Public Works. I would support Item #3 which is the creation of a No Parking ordinance along the Town roads as well as the turn around at the end to insure that we do not repeat the Saxon Hill Road issues we saw recently.

Thank you.

Charlie.

From: "Jennifer Booker" <JBooker@ESSEX.ORG>
To: "Aaron Martin" <amartin@ESSEX.ORG>, "Allyson Vile" <avile@ESSEX.ORG>, "Brad Larose" <blarose@ESSEX.ORG>, "Charlie Cole" <ccole183@comcast.net>, "Dana Hanley" <dhanley@ESSEX.ORG>, "Daniel Gregoire" <dgregoire@ESSEX.ORG>, "Dennis Lutz" <dlutz@ESSEX.ORG>, "Gregory Duggan" <gduggan@ESSEX.ORG>, "jim Jutras" <jim@essexjunction.org>, "Robin" <robin@essexjunction.org>, "Sharon Kelley" <skelley@ESSEX.ORG>
Sent: Tuesday, November 1, 2016 8:58:00 AM
Subject: 31 Allen Martin Drive

Here is a new Planning Commission Application for Prelim, 31 Allen Martin Drive
Please have comments back by November 9th 2016. Plans are in drop box and Narrative is attached as well.
https://www.dropbox.com/sh/ebw5udb0wyt7r3o/AACsJyOu5upsahqAqv61b_t6a?dl=0

Thanks,

Jenn Booker
Community Development Secretary
81 Main Street. Essex Junction VT 05452
802-878-1343
Jbooker@essex.org

Jennifer Booker

Sent DRP & Engineer 11/2/16

From: Brad Larose
Sent: Thursday, November 03, 2016 11:09 AM
To: Jennifer Booker
Subject: RE: 31 Allen Martin Drive

Jenn –

The police department has no concerns regarding this project at this point.

Thanks

Chief Bradley J. LaRose
Essex Police Department
145 Maple Street
Essex Junction, Vermont 05452
blarose@essex.org
(802) 857-0093 direct

From: Jennifer Booker
Sent: Tuesday, November 01, 2016 10:03 AM
To: Aaron Martin; Allyson Vile; Brad Larose; Charlie Cole; Dana Hanley; Daniel Gregoire; Dennis Lutz; Gregory Duggan; jim Jutras; Robin ; Sharon Kelley
Subject: FW: 31 Allen Martin Drive

This application is Forestdale Industrial Park, Thompson Drive (31 Allen Martin Drive)

From: Jennifer Booker
Sent: Tuesday, November 01, 2016 9:58 AM
To: Aaron Martin; Allyson Vile; Brad Larose; Charlie Cole; Dana Hanley; Daniel Gregoire; Dennis Lutz; Gregory Duggan; jim Jutras; Robin ; Sharon Kelley
Subject: 31 Allen Martin Drive

Here is a new Planning Commission Application for Prelim, 31 Allen Martin Drive
Please have comments back by November 9th 2016. Plans are in drop box and Narrative is attached as well.
https://www.dropbox.com/sh/ebw5udb0wyt7r3o/AACsJyOu5upsahqAqv61b_t6a?dl=0

Thanks,

Jenn Booker
Community Development Secretary
81 Main Street. Essex Junction VT 05452
802-878-1343
Jbooker@essex.org

Sent to B. Currier

11/22

Memorandum

To:	Greg Duggan, Town Planner
Cc:	Dana Farley, Community Development Director Sharon Kelley, Town Zoning Administrator
From:	Dennis E. Lutz, P.E., Public Works Director Aaron Martin, P.E., Utility Director / Town Engineer Annie Costandi, E.I., Stormwater Coordinator/Staff Engineer Daniel Gregoire, Staff Engineer
Subject:	Forestdale Industrial Park, 31 Allen Martin Drive (Preliminary Plan / Subdivision)
Date:	November 18, 2016

11/22/16

The proposed plans and other documentation for the proposed subdivision within the Forestdale Industrial Park, has been reviewed by the Public Works office and comments are provided. The comments below are general in nature and Public Works reserves the right to provide more detailed design input on future submittals.

Traffic:

1. As requested at Sketch review, the applicant has provided some traffic impact analysis for review. A copy of the traffic study performed by Trudell Consulting would be beneficial for the Town's review of the impacts of the proposed subdivision at full build out. Public Works would like to review the "fair share" analysis when calculating the proposed highway impacts and associated fees for this subdivision. A copy of this study must be provided for review before Final review of this subdivision.

2. It should be noted that the Town has contracted with the CCRPC and RSG to provide a scoping study for the VT15/Allen Martin Drive Intersection. The scoping study is virtually complete and a public presentation of the findings will occur during December. As a part of the scoping study, RSG has looked at the traffic impacts and will be providing the Town with an updated traffic impact fee for this intersection tied to the development of lots and background growth within the area impacting the intersection. It is strongly recommended that the applicant of this subdivision obtain a draft copy of the study and utilize the data contained therein for estimating the appropriate impact and impact fees.

3. It is the intention of Public Works to apply a traffic impact fee as each lot is developed and not a general impact for the entire subdivision.

4. In addition to the traffic impacts on existing intersections due to the proposed traffic to be generated from this subdivision, Public Works has concerns with the impact of additional heavy truck traffic on existing roadways within the Town. Allen Martin

Drive was resurfaced during the summer of 2015. Thompson Drive has been rated high in the 2008 Town Road Management Study for repair or added pavement overlay. The Town is currently working on a new pavement inventory and will update the current pavement priority list this year. Public Works is of the opinion that Thompson Drive will remain very high on the new priority list.

Public Works agrees with the applicant's engineers approach to the heavy truck impacts. Each of the new lots created and the future proposed uses have the potential to generate additional structural impacts on Thompson Drive principally through the weight of the truck traffic. Additional traffic impact fees will be accessed, as done in previous approvals within this corridor, to mitigate the effects of increased truck traffic.

As each proposal comes in for each lot within this subdivision, a traffic analysis will be required to access the amount of heavy truck traffic that will be generated. As In previous approvals, Public Works will use the am and pm peak hour volume from the applicant's traffic study to calculate an additional traffic volume impact fee to be used to offset pavement rehabilitation costs of Thompson Drive based on a percent of total traffic volume currently using the roadway. This percentage will be calculated using national standards, not existing traffic flows. This must be a requirement for all eight lots of this proposed subdivision.

5. The applicant has provided a parking area for public use as requested in the previous Sketch review of this subdivision. As this temporary public parking area will be maintained by the Town throughout the winter months, it is agreed that this can be utilized as a turn-around for Town vehicles as well.

6. Public Works agrees with the location of the secondary emergency access to Thompson Drive coming off of the end of Saxon Hill Road. Public Works does not agree with the width of road proposed or the depth of the subbase material as currently proposed. Public Works is of the opinion that this access road has potential to see heavy truck loads from Town emergency and maintenance vehicles. Unless calculations for the current road cross-section design can prove this cross-section can support the above mentioned vehicles, the emergency access road must be constructed similar to a Public Works Specification Class III Rural Town road.

   The road cross-section must have a depth of 24-Inches of subbase with road fabric. The width of road could be decreased to 20-Feet wide. The current proposal of 14-Feet wide is too narrow considering access to this road will be maintained year round and snow storage along the edge of the access road will be required. Furthermore, access control to the emergency road will be required. Gates must be installed at both the Saxon Hill Road and Thompson Drive entrances. Care must be taken to discourage the use of this access road by motorized vehicles.

7. Further comment regarding the proposed Town roads and access drive can be found under the Design Drawing section of this review memo.

Water/Sewer:

1. As stated in the Sketch review memo, the Lands of Allen Brook Development are located within the Town's sewer core. After development and construction of the Reinhart facility at 32 Thompson Drive, the remaining undeveloped lands currently have 34,575 GPD of unpurchased sewer allocation or 172.88 EU's within the Town's sewer system.

2. The applicants engineer has proposed a method of dividing the remaining sewer allocation between each of the eight proposed lots that staff finds to be an equitable method of distribution. The applicant proposes to model the distribution based on the existing development on Corporate Drive. This method is based on allocated sewer per acre for each lot. The average of 6,296 GPD per 34.56 acres or 182.2 GPD of sewer allocation per acre. The table below reflects this distribution method

Lot No.	Lot Size (acres)	Sewer Allocation (GPD)	Sewer Allocation (EU)
1	2.76	502.87	2.51
2	1.98	360.76	1.80
3	4.42	805.32	4.03
4	9.08	1654.38	8.27
5	5.22	951.08	4.76
6	6.47	1178.83	5.89
7	14.27	2599.99	13.00
8	4.46	812.61	4.06
Total	48.66	8865.85	44.33

After distributing the sewer allocation throughout the eight lots, the remaining lands of Allen Brook Development will have 128.55 EU's or 25,710 GPD of unpurchased sewer allocation. The sewer allocation for each of the above lots will remain with the subdivided lot. After the subdivision has been approved, the sewer allocation assigned to each lot will remain and may not be re-distributed amongst the remaining lots.

Further, it should be noted that the allocation assigned to each lot is an allocation and not a guarantee of capacity. Capacity is only guaranteed after the sewer initiation fee is paid to the Town for the actual capacity to be purchased. Unpurchased capacity within a lot's allocation returns to the Town's pool for reallocation within the sewer core.

3. The Town is aware that the Champlain Water District, (CWD) has a tank located on Saxon Hill. Current flow testing in the area does reflect that there is sufficient water

pressure and flow throughout the Forestdale Industrial Park. At this point, it does not appear that water capability will be a problem for domestic use but after the Reinhart facility was constructed, both CWD and the Town were made aware of a potential water distribution fire flow capacity issue. Providing a range of potential fire flows for the subdivided lots is not acceptable.

Furthermore, CWD and the Town have concerns regarding the sizing and capacity of fire pump design with regards to the systems capability to handle the flows generated. The water system impacts must be reviewed as a whole and not hydrant flow data in a specific location within the system. The Town will require further fire demand calculations and the impacts to the surrounding water system for review prior to Final submittal. If site required fire demands cannot be met through the municipal system, then onsite fire storage may be required.

4. Further comment regarding the proposed water and sewer infrastructure can be found under the Design Drawing section of this review memo.

Stormwater:

1. This site will require a State Stormwater Permit. The applicant shall provide Public Works with a copy of the application and calculations when submitted to the State for review.

2. EPA issued the Lake Champlain TMDL Implementation Plan which calls for higher levels of phosphorus removal for all stormwater discharges to the Lake or its tributaries. Because of this Plan, the applicant will need to provide design details for the proposed stormwater system as well as the pounds of phosphorus to be removed by the proposed system.

3. Further comment regarding stormwater can be found under the Design Drawing section of this review memo.

Design Drawings:

Sheet 0: **(Title Page)**

No Exceptions

Sheet 1: **(Overall Site Plan)**

No Exceptions

Sheet 2: **(Thompson Drive Plan & Profile 0+00 to 6+50)**

Missing 12" gate valves on either side of the 12" x 8" wet tap and valve at Sta 2+52 LT

Match lines would be very helpful for all plan sheets.
Alignment CL intersection stationing would be helpful.

Sheet 3: **(Thompson Drive Plan & Profile 6+50 to 12+21.61)**

No Exceptions

Sheet 4: **(Davison Drive Plan & Profile 0+00 to 8+20.52)**

Please provide for a cap at the end of the new 8" water main.

Sheet 5: **(Temporary Parking Lot Plan)**

No Exceptions

Sheet 6: **(Roadway Details)**

- Please include an underdrain trench detail.
- **Note #4 of the Cross-Section Typical:**
  - The appropriate color warning tape needs to be used for each utility. Just "yellow or orange" is not appropriate.
- **Note #5 of the Cross-Section Typical:**
  - Compaction Test Reports should be made available to the Town.
- **General Notes 17. E) :**
  - EPSC devises should be installed as per the Plans as well.
- **Stop Sign, Bar, and Lettering:**
  - Please use standard VTrans sign post. (2" square steel with anchor.) Stop bar should be 2' for this area. Where are the letters? Recommend reference to STD E-191 and E-193
- **No Parking Sign:**
  - Please use standard VTrans sign post. (2" square steel with anchor.)

Sheet 7: **(Sewer Details)**

No Exceptions

Sheet 8: **(Water Details)**

Please add a note requiring that all thrust blocks are to be poured in place. No precast blocks or bags of secrete will be allowed.

Sheet ST1: (Roadway EPSC & Storm water Management Plan)

Missing Inlet Protection Devices.
Stabilized Construction Entrance is labeled "Construction Entrance".
These two symbols should also be added to the legend.
The POI line-type should be added to the legend
Although the cut slopes look like 3 on 1, and temporary erosion matting unless slopes are steeper than 3 on 1, matting should be considered.

Sheet ST2: (EPSC & Storm water Details)

Erosion Control Specifications:

4. If this project falls under the General Permit, there is much more to winter erosion control than simply "doubling the rate of mulch." Reference the Winter Guidelines for Erosion Prevention and Sediment Control notes below the Erosion Control Specifications.

Winter Guidelines for Erosion Prevention and Sediment Control:

A winter Erosion Control Plan is required under the general permit and must be submitted prior to Sept. 15. Please update the requirements in this set of notes with those required for Winter Construction under the General Permit for Construction.

O'Leary-Burke Civil Associates, PLC

CIVIL ENGINEERING | REGULATORY AND PERMIT PREPARATION | LAND SURVEYING | CONSTRUCTION SERVICES | LAND USE PLANNING

December 1, 2016

Greg Duggan, Town Planner
Town of Essex, VT
81 Main St. Essex Jct., VT

RE: 31 Allen Martin Drive, Essex
Forestdale Industrial Park, Thompson Drive, Essex, VT
Responses to Public Works Preliminary Comments

Dear Greg:

We are writing on behalf of Allen Brook Development Inc. c/o Al Senecal in response to the Public Works Comments dated November 18, 2016. Please see below for our responses:

Traffic:

1. *As requested at Sketch review, the applicant has provided some traffic impact analysis for review. A copy of the traffic study performed by Trudell Consulting would be beneficial for the Town's review of the impacts of the proposed subdivision at full build out. Public Works would like to review the "fair share" analysis when calculating the proposed highway impacts and associated fees for this subdivision. A copy of this study must be provided for review before Final review of this subdivision.*

The traffic impact study completed by Trudell Consulting Engineers was included with the preliminary application materials. A copy of the report is attached. See original application narrative & submittal - GD

2. *It should be noted that the Town has contracted with the CCRPC and RSG to provide a scoping study for the VT15/Allen Martin Drive Intersection. The scoping study is virtually complete and a public presentation of the findings will occur during December. As a part of the scoping study, RSG has looked at the traffic impacts and will be providing the Town with an updated traffic impact fee for this intersection tied to the development of lots and background growth within the area impacting the intersection. It is strongly recommended that the applicant of this subdivision obtain a draft copy of the study and utilize the data contained therein for estimating the appropriate impact and impact fees.*

No response necessary.

13 CORPORATE DRIVE ESSEX JUNCTION VERMONT 05452
TEL 802 878 9990 | FAX 802 878 9989 | obca@olearyburke.com

3. *It is the intention of Public Works to apply a traffic impact fee as each lot is developed and not a general impact for the entire subdivision.*

No response necessary.

4. *In addition to the traffic impacts on existing intersections due to the proposed traffic to be generated from this subdivision, Public Works has concerns with the impact of additional heavy truck traffic on existing roadways within the Town. Allen Martin Drive was resurfaced during the summer of 2015. Thompson Drive has been rated high in the 2008 Town Road Management Study for repair or added pavement overlay. The Town is currently working on a new pavement inventory and will update the current pavement priority list this year. Public Works is of the opinion that Thompson Drive will remain very high on the new priority list.*

   Public Works agrees with the applicant's engineers approach to the heavy truck impacts. Each of the new lots created and the future proposed uses have the potential to generate additional structural impacts on Thompson Drive principally through the weight of the truck traffic. Additional traffic impact fees will be accessed, as done in previous approvals within this corridor, to mitigate the effects of increased truck traffic.

   As each proposal comes in for each lot within this subdivision, a traffic analysis will be required to access the amount of heavy truck traffic that will be generated. As in previous approvals, Public Works will use the am and pm peak hour volume from the applicant's traffic study to calculate an additional traffic volume impact fee to be used to offset pavement rehabilitation costs of Thompson Drive based on a percent of total traffic volume currently using the roadway. This percentage will be calculated using national standards, not existing traffic flows. This must be a requirement for all eight lots of this proposed subdivision.

No response necessary.

5. *The applicant has provided a parking area for public use as requested in the previous Sketch review of this subdivision. As this temporary public parking area will be maintained by the Town throughout the winter months, it is agreed that this can be utilized as a turn-around for Town vehicles as well.*

No response necessary.

6. *Public Works agrees with the location of the secondary emergency access to Thompson Drive coming off of the end of Saxon Hill Road. Public Works does not agree with the width of road proposed or the depth of the subbase material as currently proposed. Public Works is of the opinion that this access road has potential to see heavy truck loads from Town emergency and maintenance vehicles. Unless calculations for the current road cross-section design can prove this cross-section can support the above mentioned*

vehicles, the emergency access road must be constructed similar to a Public Works Specification Class III Rural Town road.

The road cross-section must have a depth of 24-Inches of subbase with road fabric. The width of road could be decreased to 20-Feet wide. The current proposal of 14-Feet wide is too narrow considering access to this road will be maintained year round and snow storage along the edge of the access road will be required. Furthermore, access control to the emergency road will be required. Gates must be installed at both the Saxon Hill Road and Thompson Drive entrances. Care must be taken to discourage the use of this access road by motorized vehicles.

A revised detail for the emergency access road has been included on SH 6 – Roadway Details. SH 1 – Overall Plan has also been revised to show gates at both entrances to the emergency access road.

7. *Further comment regarding the proposed Town roads and access drive can be found under the Design Drawing section of this review memo.*

No response necessary.

Water/Sewer:

1. *As stated in the Sketch review memo, the Lands of Allen Brook Development are located within the Town's sewer core. After development and construction of the Reinhart facility at 32 Thompson Drive, the remaining undeveloped lands currently have 34,575 GPD of unpurchased sewer allocation or 172.88 EU's within the Town's sewer system.*

No response necessary.

2. *The applicants engineer has proposed a method of dividing the remaining sewer allocation between each of the eight proposed lots that staff finds to be an equitable method of distribution. The applicant proposes to model the distribution based on the existing development on Corporate Drive. This method is based on allocated sewer per acre for each lot. The average of 6,296 GPD per 34.56 acres or 182.2 GPD of sewer allocation per acre. The table below reflects this distribution method*

Lot No.	Lot Size (acres)	Sewer Allocation (GPD)	Sewer Allocation (EU)
1	2.76	502.87	2.51
2	1.98	360.76	1.80
3	4.42	805.32	4.03
4	9.08	1,654.38	8.27
5	5.22	951.08	4.76
6	6.47	1,178.83	5.89
7	14.27	2,599.99	13.00
8	4.46	812.61	4.06
Total	48.66	8,865.85	44.33

After distributing the sewer allocation throughout the eight lots, the remaining lands of Allen Brook Development will have 128.55 EU's or 25,710 GPD of unpurchased sewer allocation. The sewer allocation for each of the above lots will remain with the subdivided lot. After the subdivision has been approved, the sewer allocation assigned to each lot will remain and may not be re-distributed amongst the remaining lots.

Further, it should be noted that the allocation assigned to each lot is an allocation and not a guarantee of capacity. Capacity is only guaranteed after the sewer initiation fee is paid to the Town for the actual capacity to be purchased. Unpurchased capacity within a lot's allocation returns to the Town's pool for reallocation within the sewer core.

The analysis described above was used to demonstrate the proposed Industrial Park would not exceed the 180 EU's of unpurchased sewer allocation assigned to the 403 acres noted as Lands of Allen Brook Development. We request that during the site plan approval process the additional allocation from the remaining lands (128.55 EU's) be made available to any uses within the Industrial Park that demonstrate the need for more allocation than shown in the table.

3. *The Town is aware that the Champlain Water District, (CWD) has a tank located on Saxon Hill. Current flow testing in the area does reflect that there is sufficient water pressure and flow throughout the Forestdale Industrial Park. At this point, it does not appear that water capability will be a problem for domestic use but after the Reinhart facility was constructed, both CWD and the Town were made aware of a potential water distribution fire flow capacity issue. Providing a range of potential fire flows for the subdivided lots is not acceptable.*

   Furthermore, CWD and the Town have concerns regarding the sizing and capacity of fire pump design with regards to the systems capability to handle the flows generated. The water system impacts must be reviewed as a whole and not hydrant flow data in a specific location within the system. The Town will require further fire demand calculations and the impacts to the surrounding water system for review prior to Final

submittal. If site required fire demands cannot be met through the municipal system, then onsite fire storage may be required.

We request that the fire flows for each lot be handled on a lot by lot basis during the site plan approval process. It is very difficult to estimate the fire flow demand of the proposed industrial park without knowing all of the specific uses. If fire flow demands cannot be met through the municipal system it is understood that onsite fire storage may be required. A permit from the Division of Fire Safety will be required for each building in the Industrial Park.

4. *Further comment regarding the proposed water and sewer infrastructure can be found under the Design Drawing section of this review memo.*

No response necessary.

Stormwater:

1. *This site will require a State Stormwater Permit. The applicant shall provide Public Works with a copy of the application and calculations when submitted to the State for review.*

No response necessary.

2. *EPA issued the Lake Champlain TMDL Implementation Plan which calls for higher levels of phosphorus removal for all stormwater discharges to the Lake or its tributaries. Because of this Plan, the applicant will need to provide design details for the proposed stormwater system as well as the pounds of phosphorus to be removed by the proposed system.*

The site is being designed to infiltrate all stormwater runoff up to the 10-year storm. According to the State of Vermont infiltrating all runoff up to and including the 1-year storm qualifies as a total phosphorus removal rate of 98%. The State of Vermont Simple Method Pollutant Loading Calculation Worksheet has been included with the application. The worksheet proves the project is 'net zero' and, according to the worksheet, will remove 0.25 lbs of phosphorus from the undeveloped existing conditions.

3. *Further comment regarding stormwater can be found under the Design Drawing section of this review memo.*

No response necessary.

Design Drawings:

Sheet 0: *(Title Page)*

No response necessary.

Sheet 1: *(Overall Site Plan)*

No response necessary.

Sheet 2: *(Thompson Drive Plan & Profile 0+00 to 6+50)*

Missing 12" gate valves on either side of the 12" x 8" wet tap and valve at Sta 2±52 LT

In order to provide gate valves on either side of the 12" x 8" tap the 12" main will need to be taken temporarily out of service to cut in the tee. It should be noted that when the line is taken out of service the fire flows will be significantly impacted in the area served by the water tank. It should also be noted, in order to prevent backflow from the second tank, wherever the closest in line downstream valve is located on Thompson Drive all of the upstream services will be without water until construction is complete. This effort will need to be coordinated with Public Works, CWD, and the Fire Department.

Match lines would be very helpful for all plan sheets

Match lines were provided at station 6+50 on both Thompson Drive P&P Sheets.

Alignment CL intersection stationing would be helpful.

The Alignment stations have been turned on at the proposed intersection on SH 2 – Plan & Profile Thompson Dr. 0+00 – 6+50 and SH 4 – Plan & Profile Davison Dr. 0+00 – 8+20.52.

Sheet 3: *(Thompson Drive Plan & Profile 6+50 to 12+21.61)*

No response necessary.

Sheet 4: *(Davison Drive Plan & Profile 0+00 to 8+20.52)*

Please provide for a cap at the end of the new 8" water main.

SH 4 – Plan & Profile Davison Dr. 0+00 – 8+20.52 has been revised to include a cap at the end of the new 8" water main.

Sheet 5: *(Temporary Parking Lot Plan)*

No response necessary.

Sheet 6: *(Roadway Details)*

Please include an underdrain trench detail.

The underdrain trench detail is included on the Thompson Dr. / Davison Dr. road cross section on SH 6 – Roadway Details.

Note #4 of the Cross-Section Typical: The appropriate color warning tape needs to be used for each utility. Just "yellow or orange" is not appropriate.

Note #4 of the Cross-Section detail has been revised to state the appropriate color warning tape shall be used for each utility.

Note #5 of the Cross-Section Typical: Compaction Test Reports should be made available to the Town.

Note #5 was revised to state the compaction test report should be made available to the Town upon request.

General Notes 17. E: EPSC devises should be installed as per the Plans as well.

General Note 17.E has been revised to state the devises should be installed per the plans.

Stop Sign, Bar, and Lettering: Please use standard VTrans sign post. (2" square steel with anchor.) Stop bar should be 2' for this area. Where are the letters? Recommend reference to STD E-191 and E-193

The Stop Sign, Bar and Lettering detail has been revised to reference a standard VTrans sign post, 24" stop bar and and STD E-191 and E-193.

No Parking Sign: Please use standard VTrans sign post. (2" square steel with anchor.)

The No Parking Sign Detail has been revised to reference a standard VTrans sign post.

Sheet 7: *(Sewer Details)*

No response necessary.

Sheet 8: *(Water Details)*

Please add a note requiring that all thrust blocks are to be poured in place. No precast blocks or bags of secrete will be allowed.

A note has been added that all thrust blocks are to be poured in place.

Sheet ST1: *(Roadway EPSC & Storm water Management Plan)*

Missing Inlet Protection Devices.

The inlet protection detail is on SH – ST2 EPSC & Stormwater Details. A typical inlet protection note has been included on SH – ST1 Roadway EPSC & Storm water Management Plan to reference the detail.

Stabilized Construction Entrance is labeled "Construction Entrance".

The note has been revised.

These two symbols should also be added to the legend.

The stabilized construction entrance and drywell symbol has been added to the legend.

The POI line-type should be added to the legend

The POI line type has been added to the legend.

Although the cut slopes look like 3 on 1, and temporary erosion matting unless slopes are steeper than 3 on 1, matting should be considered.

A note has been added to use matting to stabilize slopes greater than 3 on 1.

Sheet ST2: *(EPSC & Storm water Details)*

Erosion Control Specifications: If this project falls under the General Permit, there is much more to winter erosion control than simply "doubling the rate of mulch." Reference the Winter Guidelines for Erosion Prevention and Sediment Control notes below the Erosion Control Specifications.

A note has been added to reference the Winter Guidelines for Erosion Prevention and Sediment Control.

Winter Guidelines for Erosion Prevention and Sediment Control: A winter Erosion Control Plan is required under the general permit and must be submitted prior to Sept. 15. Please update the requirements in this set of notes with those required for Winter Construction under the General Permit for Construction.

The Winter Guidelines have been revised with all of the requirements of the General Permit for Construction.

Please find the following information attached

1) Traffic Impact Study by Trudell Consulting Engineers
2) Revised Plan Sheets
    a. SH 1 – Overall Plan
    b. SH 2 – Plan & Profile Thompson Drive 0+00-6+50
    c. SH 3 – Plan & Profile Thompson Drive 6+50-12+21.61
    d. SH 4 – Plan & Profile Davison Drive 0+00-8+20.52
    e. SH 6 – Roadway Details
    f. SH 8 – Water Details
    g. SH ST1 – Roadway EPSC & Stormwater Management Plan
    h. SH ST2 – EPSC & Stormwater Details
3) Phosphorus Loading Simple Method Calculations

If you have any question or need additional information, please let me know.

Sincerely,

Bryan Currier

Bryan Currier, PE

Simple Method Pollutant Loading Calculation Worksheet- Phosphorus

The Simple Method estimates pollutant loading of stormwater runoff for urban and developed areas. This worksheet includes the data and calculations to be used for computation of existing and post-development loads under the Interim Procedure for Offsets for Discharges of Phosphorus to Lake Champlain and Waters that Contribute to the Impairment of Lake Champlain. Fill in the shaded fields based on the project site attributes.

$L = 0.226 * P * P_j * R_v * A * C$ Additional information on the Simple Method can be found on the 'Guidance' tab

Where:

- **L** = Annual load (lbs)
- **P** = Yearly rainfall depth (in)
- P_j = Fraction of rainfall events producing runoff (use 0.9)
- **A** = Site area (acres)
- **C** = Average annual pollutant concentration (mg/l), see 'Guidance'
- **0.226** = Unit conversion factor

And:

$Rv = 0.05 + 0.009 * I_a$

Where:

- R_v = Runoff Coefficient
- I_a = Whole number percent impervious

Offset Calculations

Project Name:	Foresdale
P_j	0.9
Project P*	36.82

*http://www.ncdc.noaa.gov/cdo-web/datatools/normals

Pre-Development Condition

For undeveloped sites use these equations:

Existing Land Use	Loading Rate	Site area (ac)	Load (lbs)
Forest	0.14	2.67	0.38
Choose Land Use	0.00		0.00

OR

For sites with existing development, use the Simple Method :

Simple Method	Land Cover type	Site Area (ac)	Imp. Area (ac)	I_a (%)	R_v	C (mg/L)	Load (lbs)
Existing Conditions	Developed	0	0	0	0.05	0.44	0.00
	Pre-Dev. Total						0.38

Post-Development

Land Cover	Site Area (ac)	Imp. Area (ac)	I_a (%)	R_v	C (mg/L)	Load (lbs)
Developed	2.67	1.98	74	0.71741573	0.44	6.31
Post-Dev. Total						6.31
					Load reduction from treatment (%) (see guidance!)	98
					Post-dev. load after treatment is provided	0.13

Load Difference	Lbs to be offset	None

If the final load difference says "none", no further action is needed. If the number is positive, an offset is required. There are several different options for satisfying offset requirements including the use of additional on-site treatment, the purchase of an existing offset (if available), or the development of an offsite offset project within the same lake segment drainage area. Last revised 11/24/15